left, where the sky as indicated does not appear to be a very luminous one.

142. ". . . these Yellow Sands," John Brett, A. In this admirable picture, in which the sea and sky are quite perfect, Mr. Brett has attempted some difficult effects. More transparent water has never been seen on a canvas, and the colour of the yellow sand at its bottom is beautifully mingled with the light reflected from its surface.

626. "Sounding for Shallows at Low Nile," Tristram Ellis. A bold attempt at reflection in the Nile water, but, as a matter of fact, the real colour is not so entirely subordinated by reflection.

SNOWSTORMS

764. "The Joyless Winter Day," Joseph Farquharson. The storm must have been very considerate to the artist. In spite of the driving blast there is not a single snowflake to be seen in the first twenty yards.

THE LIVING ORGANISMS OF THE ATMOSPHERE

Les Organismes vivants de l'Atmosphère. Par M. P. Miquel, Docteur ès Sciences et Docteur en Médecine, Chef du Service micrographique à l'Observatoire de Montsouris. (Paris: Gauthier-Villars, 1883.)

PLUS occidit aer quam gladius, such is the main idea contained and explained in M. Miquel's very able and interesting book. If the modern theories are true, it must be certainly conceded that although the sword and gun are very murderous tools, air is yet more so. But on the other hand one may say of our atmosphere's murderous propensities what a French writer said when he was told that coffee was a poison: "Well, it may be a poison to be sure, but it must be a very slow one; I have been indulging in it for over fifty years." In fact, if Voltaire and many other men took too much of it, it began to tell on them only very late. Taking it for granted that coffee is murderous, it must be also granted that it is not always so. Such is also the case of the atmosphere we live in.

The influence of infinitely small organisms contained in the air and water, as well as in the body of man and animals, can no longer be denied, at least, in a general manner. Certainly much remains to be done to bring the Microbe Theory to the point it must attain; many inconsistencies and discrepancies yet interfere with its general harmony; but Davaine's and Pasteur's experiments and discoveries have certainly opened new ways in science.

Now that it is granted that the organisms alluded to are to be found and may thrive in the air, it is interesting to know what these are, how abundantly they may be found in the atmosphere, and by what means they may be captured and experimented upon. To these important questions M. Miquel answers in a very precise and interesting manner.

It is not a difficult thing to detect the corpuscles contained in the atmosphere; a mere sunbeam in a room shows hundreds of them dancing in the light. But it is less easy to ascertain the nature of these little atoms; great skill is required to do that. Some are vegetable, some are mineral, some are animal.

M. G. Tissandier has established that a great quantity of mineral atoms is contained in the atmosphere; the most interesting of these are meteoric iron melted into the form of little globules. Some infusoria are also to be found, but bits of wool and silk, pollen and spores are more abundant. As one may easily believe, all these corpuscles are less abundant in the atmosphere after a fall of rain. For instance, M. Tissandier finds in a cubic metre of air 0·023 gramme of dust after a rainless week; 0·006 gramme the day after a heavy rain.

The description given by M. Miquel of the numerous instruments contrived by himself and by others to collect the corpuscles contained in the air is good and interesting, but is not easily condensed. Another very important chapter of this book is that concerning the nature and origin of the aërial corpuscles among which pollen, flour, and spores are most abundant. For instance, the number of spores to be found in a cubic metre of air is about 14,200. But this number changes very much according to the season. In winter the mean number is 6200; in spring, it is 13,000; in summer, 28,000; in autumn, 9800. The reason of these variations is easy to understand.

However abundant spores and pollen, woollen and silk threads may be in the air, that is a question of little importance when compared with that of the presence of bacteria in the atmosphere. Bacteria are to be found, often in great quantity, in the air. Generally speaking, according to M. Miquel's experiments and observations, bacteria are more abundant when the weather is dry; the reverse is to be observed concerning spores of inferior cryptogams. The direction of the prevailing wind has much to do with the number of bacteria found in the air. M. Miquel shows, by means of a diagram, how the air having passed through part of Paris, before coming to the Montsouris Observatory, contains more bacteria than that which passed only over the suburbs and country around the town. South winds bring from 42 to 77 bacteria to a cubic metre of air; northern ones bring from 108 to 152. Other experiments give the same results. M. Miquel draws from his numerous experiments the conclusion that the air in Paris contains nine or ten times more bacteria than does that outside of the fortifications or close to them. For instance, in the Rue de Rivoli, M. Miquel finds an average number of 760 bacteria in autumn, 410 in winter, 940 in spring, and 920 in summer; that is, a mean annual number of 750 bacteria per cubic metre of air. At Montsouris the mean annual number is 75. The minimum number found by M. Miquel is 45 (winter 1882); the maximum is 3000 (summer 1881) bacteria per cubic metre.

In hospitals, the air contains a much greater quantity of bacteria, as might be expected; the cubic metre contains an average of five or six thousand! In some cases M. Miquel has found ten, even sixteen, twenty-one, and *twenty-eight thousand* bacteria per cubic metre of air. These last numbers are stupendous.

These bacteria in the air, liable every moment to penetrate into our lungs and body, are of many sorts. Some are spherical,—the *sphero-bacteria*; they generally have no power of locomotion; some are coloured red or yellow. M. Miquel remarks that although some of these bacteria must exert a pathogenetic action, he has not been able to produce any disease in ani-

mals by means of these organisms. It may be that the atmosphere kills these bacteria, it may be that the animals experimented upon were not liable to catch the disease; at all events it would seem that no pathogenetic bacteria are to be found in the air. This is a very important conclusion, but it is not yet sufficiently supported by facts. How could scarlet fever, measles, and other diseases be brought by a physician from a patient to a healthy person if the bacteria could not resist the action of the air for some time?

Other bacteria present a more elongated shape: they are called *bactéries en batonnets*. They generally move about, sometimes very slowly, sometimes with great rapidity, in various manners, when they are allowed to remain in a suitable liquid. M. Miquel has remarked that one of these bacteria converts sulphur into hydrosulphuric acid in a very energetic manner; together with another similar bacterium it is the principal agent that converts urine into sulphuret of ammonia. M. Miquel cannot say exactly as to the presence of pathogenetic bacteria in the atmosphere, nor especially as to their precise nature and *modus faciendi*.

Bacilli are also to be found in the atmosphere; they may be long or short; the less they move about the longer they become. One of these bacilli resembles very much the *Bacillus amylobacter* (van Tieghem). Another one seems pathogenetic; it brings on, in animals, a phlegmon that generally terminates—as is the custom of most phlegmons—in suppuration. Of course many other pathogenetic bacilli perhaps exist in the atmosphere, but that question has not been specially discussed by M. Miquel. He shows very well how considerable an influence the rainfall exerts on the number of the bacteria contained in the air. Temperature has little to do with this as diagrams show; rain on the contrary has a great effect. As soon as the weather becomes dry the number of the bacteria increases; when it is rainy this number falls rapidly. This result is one of the most important among those M. Miquel has attained, inasmuch as this *savant* shows that rainy periods are those during which the bacteria multiply.

If the number of these organisms is considerable in the air we breathe every day, one thing must however console us in some degree. If these bacteria are murderous, they are somewhat like the coffee; they kill very slowly in most cases. Many of them must each day come into our lungs and body, and yet we feel none the worse for it generally. This does not mean that they are not dangerous; it means only that they are not always able to act a dangerous part. For what reason, we know not yet. Typhoid fever, cholera, yellow fever, measles, scarlet fever, and a great many other diseases are contagious; but all persons who live with patients suffering from either of these diseases do not catch them. Most doctors and medical students do not catch any contagious disease in the hospitals, and yet they doubt not the nature and danger of these diseases.

Whatever opinion one may entertain as to the Microbe Theory, it must be admitted that M. Miquel's book is exceedingly useful and well arranged. M. Miquel understands the matter thoroughly, and his book will certainly be much read abroad, as it has been in France.

HENRY DE VARIGNY

ANIMAL TECHNOLOGY

Animal Technology as Applied to the Domestic Cat. An Introduction to Human, Veterinary, and Comparative Anatomy. By Burt G. Wilder, B.S., M.D., and Simon H. Gage, B.S. (New York and Chicago: A. S. Barnes and Co., 1882.)

MESSRS. BURT WILDER AND GAGE are not the first anatomists to employ the domestic cat as an introduction to the study of vertebrate anatomy. In 1881 Mr. St. George Mivart published an elaborate treatise on the Cat, as a type for examination and comparison with other vertebrates; and as far back as 1845 M. Straus-Durckheim issued his well-known work in the French language on this animal.

The book now before us differs however in its scope and mode of treatment from its English predecessor. It is not like Mr. Mivart's, a systematic treatise on the anatomy of the cat, both macroscopic and microscopic, with chapters on its development, psychology, specific forms, geographical distribution, &c. But it is a practical treatise written with the object of instructing the student in the methods of dissecting and displaying the structure of this animal.

As preliminary to the anatomical description, the authors have written some short chapters on the instruments employed in dissecting, the modes of using them, the methods of injecting, and the preparation and preservation of anatomical specimens, so as to justify the title of Anatomical Technology given to the book. We would especially direct attention to the sections on the maceration of bones and the preparation of skeletons as furnishing the young anatomist with useful hints on these subjects.

Those who are familiar with the papers on Anatomical Nomenclature by Prof. Wilder in the American Journal *Science*, and elsewhere, will not be surprised to find that he has in this work again enunciated his views on Terminology, and adopted many but little used, as well as new terms in his descriptions. There can be no doubt that the terms used in anatomical description in many instances would be improved by being altered. No one who is engaged in the comparative study of the anatomy of the human body, with that of other vertebrates, but must constantly feel a difficulty in the use of the terms employed to express position. He has ever to keep in mind that a surface which is superior in man is anterior in any other vertebrate, and that a surface which is posterior in man is superior in vertebrates generally. Hence such terms as dorsal and ventral, cephalic and caudal, are much to be preferred to express corresponding surfaces throughout the vertebrata, whatever may be their direction, than posterior, anterior, inferior, superior. If indeed the recommendations made by the Edinburgh anatomist, Dr. Barclay, in the early part of this century, had been attended to, then anatomical description would by this time have been on a much more satisfactory basis than it is. The delay and difficulty in effecting the necessary reforms are largely due to the works on human anatomy having been for the most part written by men, who are specialists in that department only, and have not had a wide and philosophical training in the whole subject. The introduction, however, of biological study into